



eValve-4 Controller
Controller for bistable
electromagnets

 **GÜNTHER®**
HOT RUNNER TECHNOLOGY

Operating instructions



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1 General

The Controller „eValve-4“ is able to control up to four bistable electromagnets, which are used for nozzles with needle valve. The electrical lift magnet generate a mechanical lift of 10mm. The two end position will fixed with permanent magnets. Electric power is only use for changing the position of the magnetic fixed lifting cylinder.

The bistable lift magnets (type UV75-HS2118) have a electric coil, which is connect to positive or negative DC voltage to change the position. The controller “eValve-4” employ the AC supply voltage (230V_{eff}) to create a pulsating DC voltage. The DC voltage is transmit for 250msec to a electrical switching output.

The “eValve-4” have four separate outputs, which can controlled by four digital input signals (24V logic).

When the galvanically isolated input signal is applied, the 1st switching impulse with negative control voltage open the associated needle valve. Until the control signal is switched off, the controller generate a 2nd switching impulse when a positive input signal follows. Then the needle valve is closed again.

The two end positions of the lift magnet are signalled by inductive proximity switches and displayed on the controller front panel. With this position signals the controller can define the real circuit time of the coupled needle valves.

For the parameterisation of the switching times, the “eValve-4” have a eight-digit LED-Display and the known menu navigation of previous controllers.

2 Operating Instructions

On the front panel of the “eValve-4” controller are different indicators. The display and the LEDs are helpful for the period of configuration. During operation the controller counts the injection cycles for each channel.

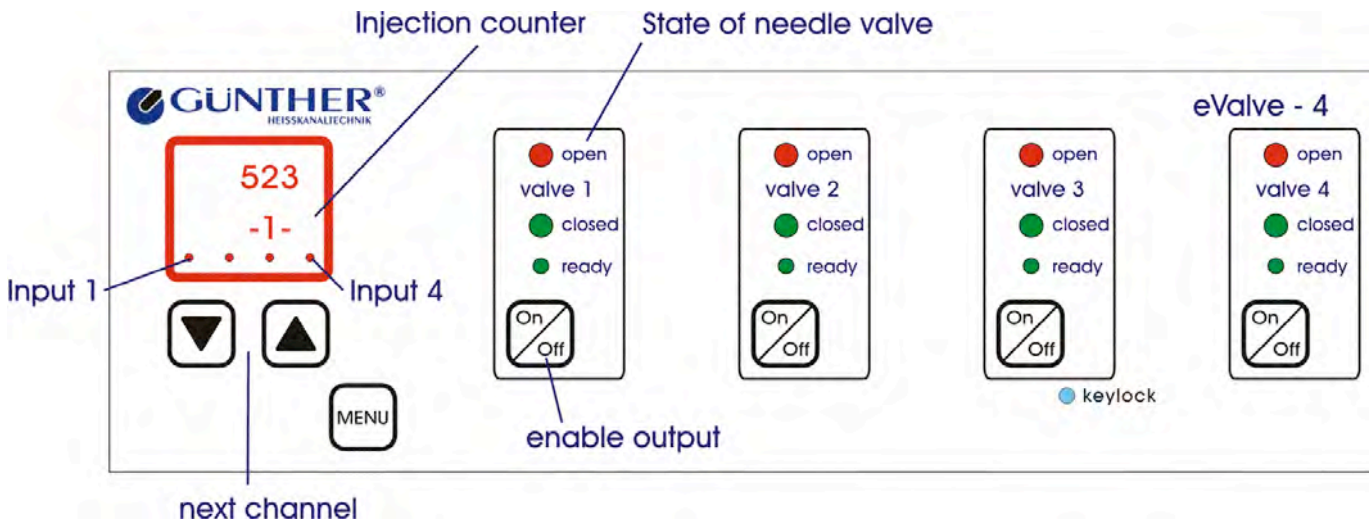


Fig. 2.1 control panel

The „▼“ and „▲“ keys are normally used to select a channel for the injection counter. By pressing the “MENU”-button you activate the user menu. Here you can change different parameter settings. Inside the user menu you reach the selected menu item by pressing the “MENU”-Button. Use the „▼“ and „▲“ keys to select a new menu item or to change a value.

Each of the four switching outputs indicates separately the position of the two end position switches („OPEN “and „CLOSED “). In idle mode, all needle valves are in the position “CLOSED” and should indicate a closed melt channel. The opened needle valve is indicated with a red LED, since the plastic melt can be pressed now into the form.

With the ON/OFF buttons each of the four switching outputs can be activated independently. During deactivated switching output the associated lifting magnet is no more supplied with tension and thus follows also not more the input signal.

In the normal operating mode (mode 1) the injection is started by a control signal on the inputs (IN-1 to IN-4). On the part of the moulding machine a floating contact must be connected for the point of starting time of the injection. This must be wired as pointed in illustration fig. 2.2 to the eValve-4 controller. With switching the starting signal on, a pulsating DC voltage (negative) for a short period from 0.25 seconds is put at the electrically operated bistable lifting magnets. The needle valve remains now opened until the input signal switches off again. Then pulsating DC voltage, however this time with inverted polarity, is switched again on the lifting magnets.

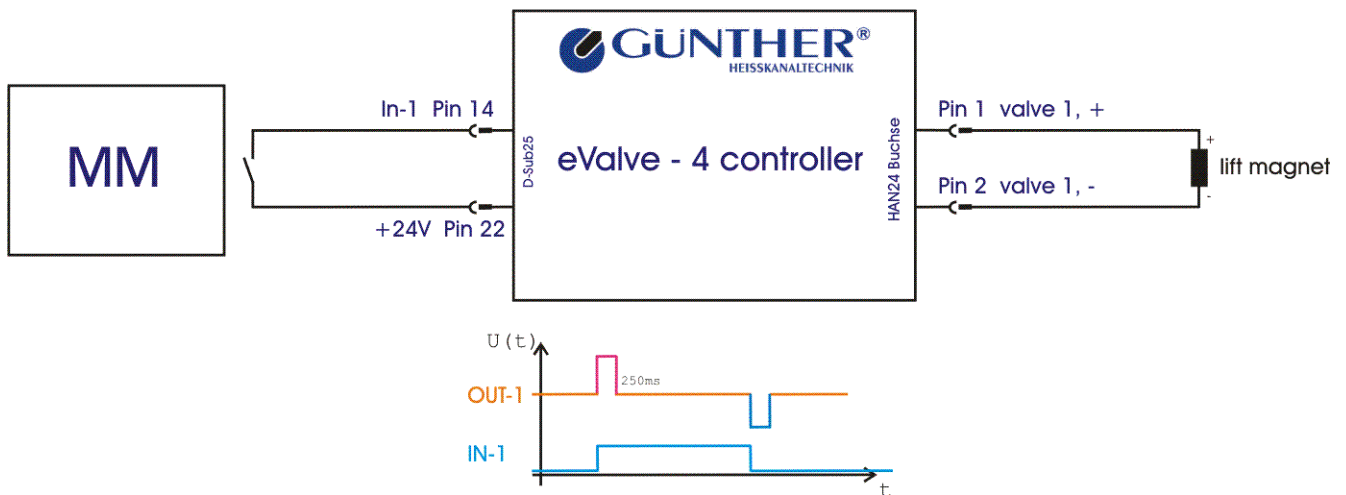


Fig. 2.2 Connection example: moulding machine / lift magnet

Each switching impulse indicates the injection time during a moulding cycle. The minimum possible cycle time is above 0.5 seconds, since the IN- and OUT- pulses were set to 0.25 seconds for standard adjustment. In principle the cyclic duration can be reduced over the parameter - 1 - „VALVE_ON_TIME “on for example 0.15 seconds, if a faster cycle time must be realized..

2.1 Start delay

The turn-on pulse supplied by the moulding machine can be set with time-delay for each switching output. In this way for example solutions can be realized, which produce up to four different starts of injection with only one starting signal on the part of the moulding machine.

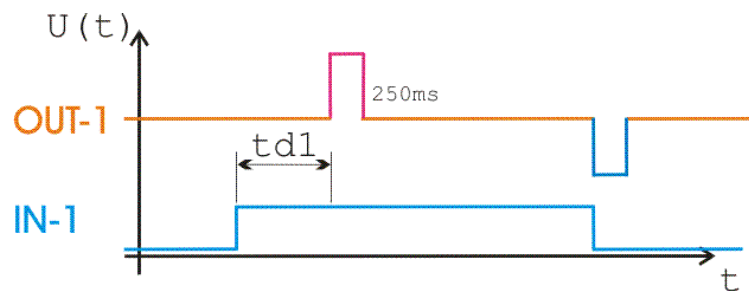


Fig. 2.3 Start delay channel 1

The signal delay $td1$ to $td4$ can be set in the user menu in a range from 0,01 to 99 seconds.

Note:

Switched the input signal off during the signal delay, the switching exit is not set at all.

2.2 Mode 2 „single impulse“

In normal operation mode always a switching off pulse follows after switching on pulse. A needle valve, which is connected in the wrong way, moves always in both directions. In order to bring it into the correct starting situation, it is necessary to give a single pulse on the electrical lifting magnets.

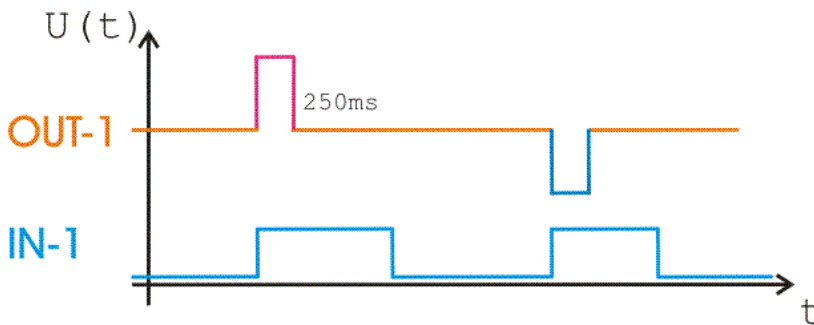


Fig. 2.4 Input signal create a single impulse

For each input signal (IN-1 to IN-4) only one impulse with changing polarity is produced. Thus the needle valve can be driven into the desired position during start-up.

You can select the operating mode in the user menu with the point of menu „MODE “.

2.3 Mode 3 „manual“

To test purposes and during installation it can be helpful to handle the needle valves manually, by pressing a key to operate it. In the operating mode 3 „manual “ is the controllability of the lifting magnets as in normal operation (operating mode 1) over the input signals IN-1 to IN-4 possible. Additionally one can use the ON/OFF key of each channel to open or close the needle valve. The first actuation of the ON/OFF button opens that needle valve and with the second pressure it will be closed again.

Note:

During manual operation the lifting magnets of the associated needle valve remains permanent in the activated position. During test and start-up this mode for authorized technical personnel represents a helpful function. After end of test, the operation mode must be changed into normal operation again.

2.4 Load defaults

The operating parameters of the eValve-4 can be changed variably on the parameter level. If these values have been set wrong, it is possible to load the default values with the factory settings. For this the buttons "A", "B" and "MENU" must be pressed, when the automatic controller is turned on.

Display	Description
LOAd EF.	The Text is displayed for about 5 seconds. During this time the automatic controller loads the default values.

3 Parameter setting

3.1 User menu

The function of the automatic controller can be adapted by the attitude of operating parameters. After pressing the menu button, you can modify those operation values, which are used for normal handling of the controller.

By pressuring the menu button, the user menu is started. Each further actuation of the menu button leads to the next menu option. With the button „▼“ or „▲“ the state of the respective menu option can be changed. The menu value changes then e.g. from „- NO “on „- YES “. In the menu option you can make then the respective setting. The new attitude is only taken over if you press the menu key for confirmation. If you do not press a key the user menu is terminated automatically after 10 seconds (without transfer the changes).

Structure of the user menu :

Display	Description
quit	exit menu By selecting quit, the parameter menu is closed. Press key A1 or B1 to return to the normal operating level. If for approx. 10 seconds no key is pressed, the parameter menu is quit automatically.
MOdE	Operating mode Is used to select the operation mode of the eValve. (normal, single impulse or manual mode) see chapter 2.2 and 2.3
td 1	Start delay for output 1 see chapter 2.1
td 2	Start delay for output 2 see chapter 2.1
td 3	Start delay for output 3 see chapter 2.1
td 4	Start delay for output 4 see chapter 2.1
ConF	Configuration menu Over the menu option „CONF. “ the configuration level can be achieved. This level is protected with a password.

Beyond that there are some special settings in the configuration menu. The configuration menu serves the setting of important operating parameters and limit values. It is therefore protected by a password input against unintentional change.

Caution:

The access to configuration data is protected by a password. The configuration should only be changed by authorised and qualified personnel. Inexpert configuration may cause damage of the hot runner system. The person who sets the unit into operation is responsible for the correct configuration of the controller.

3.2 Configuration menu

The operating parameters of the controller eValve-4 can be adjusted in the configuration menu. Apart from the menu options for the more frequently used parameters, the menu option "SYS" the gives full access to all operating parameters. Changes of system parameters must be carried out by authorised and qualified personnel.

Display	Intent
ConF - - - -	Configuration menu Open the configuration menu over the menu option "CONF" of the user menu. In this menu option, you can change parameters, who usually must be changed only uniquely for system installation. To open the configuration menu it is necessary to input a password. Consider that the digits of the password have to be entered starting right (!) by pressing „▼“ or „▲“. Enter by pressing key "Menu".
CLR	Clear injection counters Reset the counters for the four lifting magnet manipulations.
Hour	Operating hours Shows the operating hours of the automatic controller.. (operating hours < 10 h. Display: hh..mm operating hours ≥ 10 h. display: hhhh
SYS	System parameter menu This password-protected menu permits the adjustment of all operating parameters of the EVALVE-4. Changes at the operating parameters should be accomplished only by authorized technical personnel.
qUlt	Quit menu Over the menu option "Q" the configuration menu is left. If for approx 10 seconds no button is pressed, the parameter menu ends automatically. Also by pressures of the buttons „▼“ or „▲“ the EVALVE-4 returns to the normal operating level.

3.3 System parameter

With the help of the internal system parameters the behaviours of the control can be adjusted in detail. The system parameters are listed in correct order and stored in the internal EEPROM. They should be changed only by authorized technical personnel.

The following parameters are in use:

Number	Name	Description
1	VALVE_ON_TIME	cycle time of the ON- and/or OFF- pulse in units of 10 msec default : 25 (250 msec) range : 10 - 500
2	VALVE_USED	Bit matrix of the used output switches
3	VALVE_MODE	Operation mode of the valve control
4	VALVE_DELAYTIME_1	Start delay for the 1 st output In units of 10 msec

Number	Name	Description
		default : 0 range : 1 – 9900 (0,01 ... 99 sec)
5	VALVE_DELAYTIME_2	Start delay for the 2 nd output In units of 10 msec default : 0 range : 1 – 9900 (0,01 ... 99 sec)
6	VALVE_DELAYTIME_3	Start delay for the 3 rd output In units of 10 msec default : 0 range : 1 – 9900 (0,01 ... 99 sec)
7	VALVE_DELAYTIME_4	Start delay for the 4 th output In units of 10 msec default : 0 range : 1 – 9900 (0,01 ... 99 sec)
8	USER_PASSWORD	User password If you like to use another password for the configuration level, as the default password "0099" default : 99 range : 1 – 9999
9	KEYLOCK	State of the keylock button
10	DELIVERYDAY	Delivery day
11	SERIAL	Serial number of the automatic controller
12	FIRMWARE_VERSION	Version number of the firmware
13	VALVE_SHOT1_H	HIGH-word of the 32 bit injection counter for valve 1
14	VALVE_SHOT1_L	LOW-word of the 32 bit injection counter for valve 1
15	VALVE_SHOT2_H	HIGH-word of the 32 bit injection counter for valve 2
16	VALVE_SHOT2_L	LOW-word of the 32 bit injection counter for valve 2
17	VALVE_SHOT3_H	HIGH-word of the 32 bit injection counter for valve 3
18	VALVE_SHOT3_L	LOW-word of the 32 bit injection counter for valve 3
19	VALVE_SHOT4_H	HIGH-word of the 32 bit injection counter for valve 4
20	VALVE_SHOT4_L	LOW-word of the 32 bit injection counter for valve 4
21	DEVICE_ADDRESS	Device address of the serial interface default: 1
22	Operating hours	Internal
23	Operating minutes	Internal
24	WITHOUT_SWITCHES	Using this controller without a feedback of the limit switches. (Valves without limit switches don't display the valve position and show a fault.) If this parameter is set on 1, then the valve position is indicated according to the switching sequence. default: 0

4 Further functions

4.1 serial interface

The serial RS232-Schnittstelle serves the cyclic edition of the current switching times of the controller eValve-4. She works in the half-duplex mode with the Baud rate of 9600 Bit/s (8 data bits, NO parity, 1 stop bit) without hardware handshakes. We used three lines (RXD, TXD and GND), which are wired on a 25-pin-DSUB plug connector.

With the help of a terminal program (e.g. Hyper Terminal MS Windows XP) one can represent the text messages of the eValve-4 on a PC-Display or if necessary they can be saved in a file and evaluated later.

After the eValve-4 was switched on, the following greeting message appears on the serial interface

```
GÜNTHER Heisskanaltechnik GmbH, eValve-4 controller V1.0.1
serial nr: D9010123 operation hours: 56:13
-----
T-ON-1, T-OFF-1  T-ON-2, T-OFF-2  T-ON-3, T-OFF-3  T-ON-4, T-OFF-4
-----
```

Afterwards, the last measured switching times are sent every 5 seconds to the interface .
A protocol record could look as follows:

```
0,08/ 0,06  0,07/ 0,06  0,08/ 0,06  0,08/ 0,06
0,08/ 0,06  0,07/ 0,06  0,08/ 0,06  0,08/ 0,06
0,07/ 0,05  0,07/ 0,06  0,08/ 0,06  0,07/ 0,06
0,08/ 0,06  0,07/ 0,05  0,08/ 0,06  0,08/ 0,06
0,08/ 0,05  0,09/ 0,06  0,08/ 0,05  0,09/ 0,06
0,08/ 0,06  0,08/ 0,06  0,08/ 0,06  0,08/ 0,06
0,08/ 0,06  0,07/ 0,07  0,08/ 0,06  0,08/ 0,06
```

4.2 Counter operating time

The operating time of the eValve-4 can be read via the menu item "hour".

operating time < 10 hours display: hh.mm

operating time ≥ 10 hours display: hhhh

5 Connection of the lifting magnets

The wall plug of the bi-stable lifting magnets is placed on the back of the automatic controller. To each lifting magnet coil the digital input signals of the inductive end position switches are assigned. The inductive proximity switches for signalling of the valve position are used for a feedback and error evaluation. In case of not attached end position switches, the "READY LED" of the associated channel flashes to display the error. A channel goes into the error condition, if the valve is not signalled than open or close.

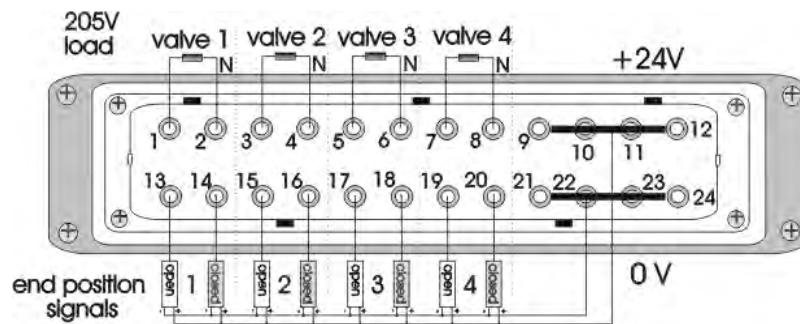


Fig. 5.1 Connecting plug HAN24ES

The coil of the bistable lifting magnets (UV75-HS2118) are driven with the commutate mains voltage. To open a needle valve charge the lifting magnet with a negative and for closing with positive DC voltage.

Note:

It is necessary to check the polarity of each lifting magnet.

The coil of the lifting magnets is in principle an inductance without polarity, however the effect direction is changed with the polarity reversal of the coil.

Lifting magnet	1	2	3	4
Coil (+)	1	3	5	7
Coil (-)	2	4	6	8
Limit switch "open"	13	15	17	19
Limit switch "closed"	14	16	18	20

Fig. 5.2 Layout for four bistable lifting magnets together with the limit switches

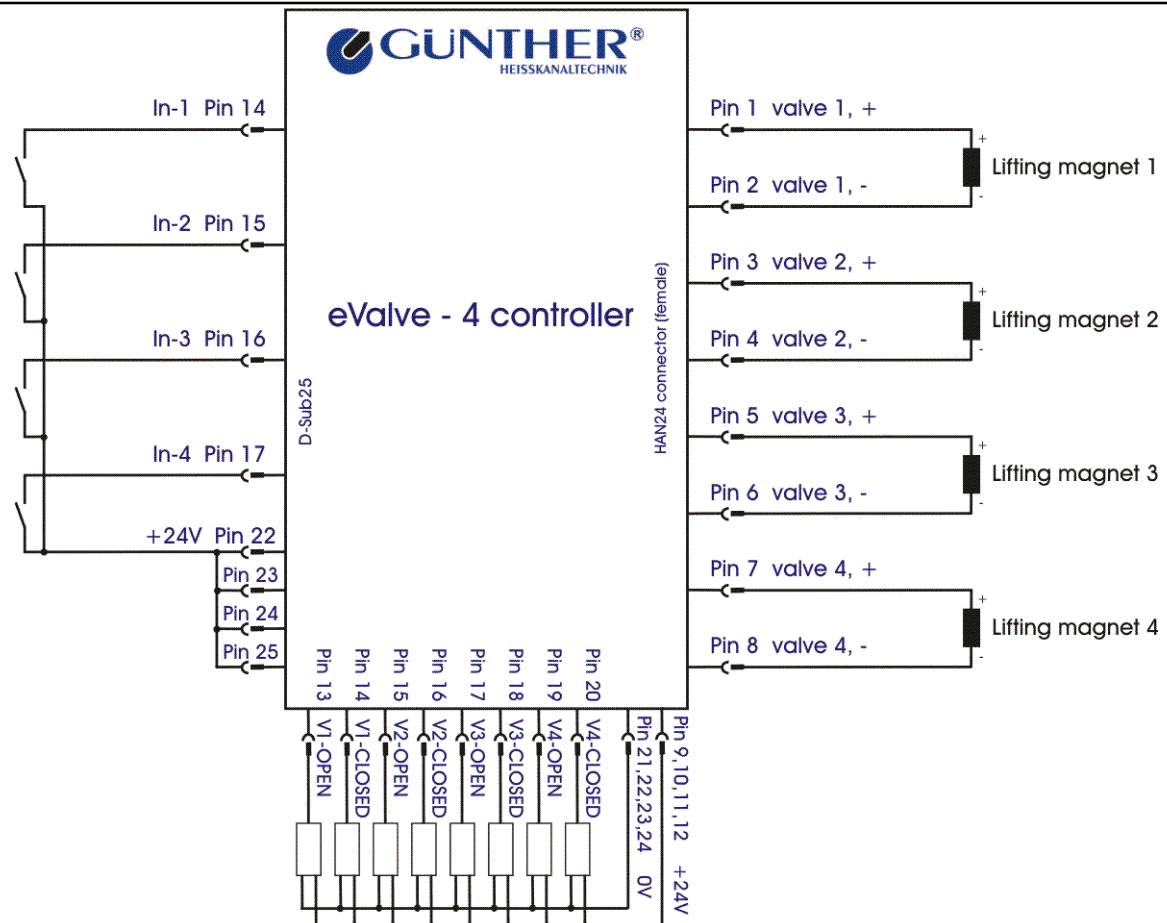


Fig. 5.3 Connection diagram for four bistable lifting magnets

The digital inputs IN-1 to IN-4 works with a logic level of +24V. If your moulding machine supplies the starting signals for injection directly as 24V-Signal, you can wire these directly on the input signals IN-1 to IN-4. The mass potential (SUB-D pin 18-21) of both controllers must be however coupled then.

The connection diagram from Fig. 5.3 assumes your moulding machine makes the starting signal available as a potential-free relay contact. In this case the internal +24V auxiliary supply is used to create the power level.

5.1 Safety information

The controller „eValve-4 “produces DC voltage of 205V on all four switching exits, which are needed for the control of electrical lifting magnets. Although the lit main switch on the back of the device, the power line separates two-pole and a two-pole separation of the load circuit on the controller PCB was realized, we would like to point out that the power supply plug is to be pulled before all electrical work.

Ensure that your local supply voltage corresponds to the unit's nominal voltage before switching on. For safe operation, the unit must be plugged into an earthed socket. Any disconnection of the earthed conductor, e.g. by using an extension flex without earthed conductor, may cause severe danger!

Caution: Always disconnect the unit before opening! Pull mains plug!

This control unit contains hazardous voltage. Any repair and service work must be carried out by qualified and authorised personnel only. The components inside the unit are maintenance-free for our customers. They are exclusively serviced by Gunther Hot Runner Systems.

To operate the control unit, a fuse protected socket must be used. The eVavle-4 is equipped with a one phase 16A-plug. Please ensure that the sockets used are protected sufficiently.

6 Specifications

Nominal voltage:	220V - 240V AC, 50/60 Hz
Nominal Capacity:	3500 W, 1 x 16 A
Stand-by Capacity :	approx. 8 VA
Output Lift Magnet :	24-pole connector (female) Type Harting HAN ES 4 outputs with pulsed control voltage of 205VDC for the connection of reversal lifting magnets type UV75-HS2118, R = 68 Ohm, I _{max} = 6 A,
Mains plug:	3 m, 16A plug (earthed socket)
Limit switch connector:	24-pole connector (female) type Harting HAN ES 24 V DC auxiliary supply with I _{max} = 160mA (Polyfuse inside the device)
Error output :	relay change-over contact 1 x UM 30 V / 5 A
Fuse:	16 A FF type Schurter SA super fast
Storage Temperature:	0 - 70°C
Operating Temperature:	0 - 50°C
Protection Type:	IP 20
Dimensions (W, H, D):	259mm x 95mm x 290mm
Colour:	grey RAL 9018

7 Appendix

7.1 Appendix A - Addresses

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7.2 Anhang B - EG-Declaration of Conformity

For the following below listed products:

Günther-Valve Controller, Typ eValve-4

we hereby confirm that above listed products comply to all important (*) safety requirements that have been declared by the Council of Assimilation of Legal Regulations by the EC membership countries concerning electromagnetical conformity.

**89/336/EWG EMV
73/23/EWG Low Voltage Requirements**

To verify these products to electromagnetical conformity the following standards were referred to:

**EN 50081, Part 2
EN 50082, Part 2**

The above mentioned products also comply to:

DIN EN 61010, Teil 1/03.94.

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D-50181 Bedburg**

Bedburg, 10.16.2008

**J. Marquardt
(Managing Director)**